# Air Quality in Alberta
# July to September, 2002

Alberta Environment continuously monitors air quality in Edmonton (three stations), Calgary (three stations), Red Deer, Fort Saskatchewan and Beaverlodge (35 km west-northwest of Grande Prairie). Air pollutants monitored at Alberta Environment stations include carbon monoxide, dust and smoke, oxides of nitrogen, ozone, total hydrocarbons, hydrogen sulphide, sulphur dioxide, ammonia and particulates ($PM_{10}$ and $PM_{2.5}$). The Index of the Quality of the Air (IQUA) is calculated at the Edmonton, Calgary, Red Deer and Fort Saskatchewan stations. The IQUA converts air pollutant concentrations into ***Good***, ***Fair***, ***Poor*** and ***Very Poor*** air quality ratings.

## Highlights

- **Air quality was rated as *Good* over 93 per cent of the time at Alberta monitoring stations from July to September 2002.** The frequency of *Good* air quality ratings was slightly lower than the long-term average at all stations. *Good* air quality is the best possible rating and means that there are no known harmful effects to human or environmental health.

- **Air quality was rated as *Fair* from one to seven per cent of the time at Alberta monitoring stations in the third quarter of 2002.** The frequency of *Fair* air quality ratings was slightly higher than the long-term average at all stations. *Fair* air quality means that there is adequate protection against harmful effects to human or environmental health. The decrease in *Good* air quality, and corresponding increase in *Fair* and *Poor* air quality, was primarily due elevated ground-level ozone levels caused by unusually hot weather conditions. For example, the Edmonton Central station recorded 21 days with an ambient temperature higher than 30°C in July and August. Under hot weather conditions, more ozone is produced at the ground level from natural and human sources. These higher ozone levels can lead to an increase in summer time smog events.

- ***Poor* air quality was reported on five days in Edmonton, Calgary or Fort Saskatchewan in the third quarter of 2002.** *Poor* air quality caused by elevated ground-level ozone concentrations that were reported on July 11, 12, 13 and 24 and on August 24, 2002. Under hot

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Alberta
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weather conditions, elevated ozone levels can occur due to a complicated set of chemical reactions involving oxides of nitrogen and volatile hydrocarbons in the presence of sunlight. In Edmonton and Fort Saskatchewan, ozone levels exceeded the one-hour guideline a total of eleven times in the third quarter. Because of high ozone levels, Capital Health issued a health advisory on July 12. Over the past ten years, *Poor* air quality has occurred for 65 hours, or 0.03 per cent of the time, in the third quarter at Alberta Environment monitoring stations.

- ***Very Poor* air quality did not occur at Alberta monitoring stations from July to September 2002.** *Very Poor* air quality is rare in Alberta with no occurrences reported over the last ten years (1992 to 2001) in the third quarter.

- **Air quality guidelines for hydrogen sulphide were exceeded at the Calgary East station.** The one-hour guideline was exceeded four times at the Calgary East station, on July 12, 23, 24 and 30. Elevated hydrogen sulphide levels at the Calgary East station were due to emissions from the nearby sewage treatment plant.

- **Continued decreasing levels of carbon monoxide were noted at all Edmonton and Calgary stations.** Carbon monoxide concentrations at Edmonton and Calgary stations were 27 to 44 per cent lower than the average levels over the previous ten years (1992 to 2001). The major source of carbon monoxide is vehicle exhaust emissions. Lower carbon monoxide levels are primarily due to better emission control systems on newer vehicles.

## Number of Times Air Quality Guidelines were Exceeded - July to September, 2002

| Station | Carbon Monoxide | | Dust and Smoke | Hydrogen Sulphide | | Nitrogen Dioxide | | Ozone | Particulate | Sulphur Dioxide | | Ammonia |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1-hour | 8-hour | monthly | 1-hour | 24-hour | 1-hour | 24-hour | 1-hour | 24-hour $PM_{2.5}$ | 1-hour | 24-hour | 1-hour |
| Edmonton Central | 0 | 0 | 0 | n/a | n/a | 0 | 0 | 4 | 0 | n/a | n/a | na |
| Edmonton Northwest | 0 | 0 | 0 | n/a | n/a | 0 | 0 | 2 | 0 | n/a | n/a | na |
| Edmonton East | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | na |
| Calgary Central | 0 | 0 | 0 | n/a | n/a | 0 | 0 | 0 | 0 | n/a | n/a | na |
| Calgary Northwest | 0 | 0 | 0 | n/a | n/a | 0 | 0 | 0 | n/a | n/a | n/a | na |
| Calgary East | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | n/a | 0 | 0 | na |
| Red Deer | 0 | 0 | n/a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | na |
| Fort Saskatchewan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Beaverlodge | n/a | n/a | n/a | n/a | n/a | 0 | 0 | 0 | n/a | 0 | 0 | na |
| Guideline | 13 ppm | 5 ppm | 90% of values< 1 COH unit | 0.01 ppm | 0.003 ppm | 0.212 ppm | 0.106 ppm | 0.082 ppm | 30 µg/m3 * | 0.172 ppm | 0.057 ppm | 2.0 ppm |

na Parameter not monitored at this location.

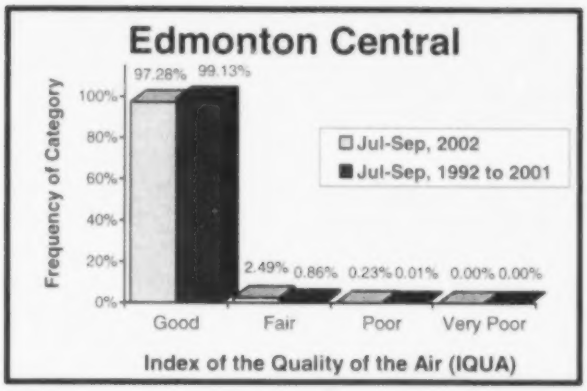
* The level and form of the achievement statistic specified the $PM_{2.5}$ Canada-wide Standard is 30 $\mu g/m^3$, for 24-hour averaging time, based on the 98th percentile annual value, averaged over three consecutive years. (Canadian Council of Ministers of the Environment. 2001. Guidance Document on Achievement Determination: Canada-wide Standards for Particulate Matter (PM) and Ozone.)

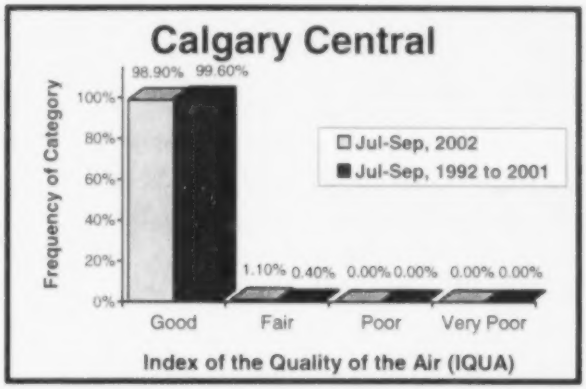
## The Index of the Quality of the Air

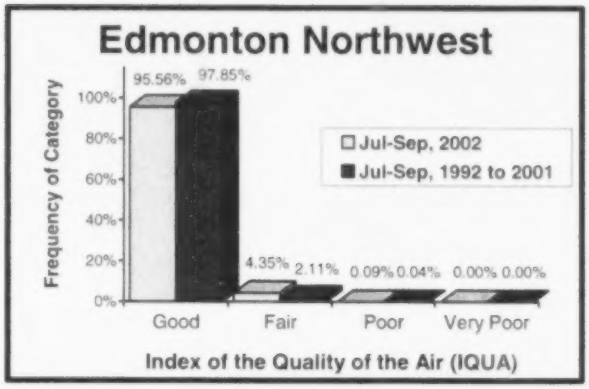
The index of the quality of the air (IQUA) provides the public with a meaningful measure of outdoor air quality. The IQUA is calculated every hour at all Edmonton, Calgary, Red Deer and Fort Saskatchewan monitoring stations. From this index, we can effectively rate air quality as Good, Fair, Poor or Very Poor. Air pollutants used to calculate the IQUA are carbon monoxide, dust and smoke, nitrogen dioxide, ozone and sulphur dioxide. Good, Fair, Poor and Very Poor air quality categories are directly related to guidelines under Alberta's *Environmental Protection and Enhancement Act*, and National Ambient Air Quality Objectives.

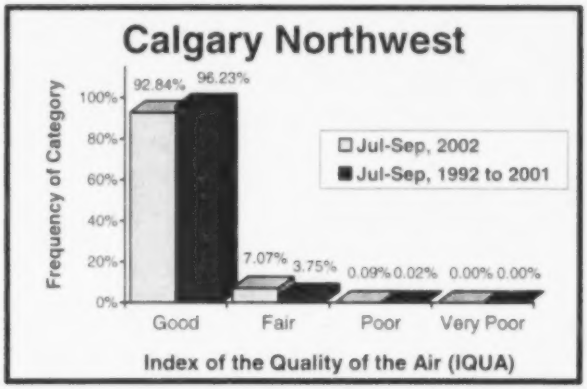
| IQUA rating | Description |
|---|---|
| **Good** | Desirable range: no known harmful effects to soil, water, vegetation, animals, materials, visibility or human health. The long-term goal is for air quality to be in this range all of the time in Canada. |
| **Fair** | Acceptable range: adequate protection against harmful effects to soil, water, vegetation, animals, materials, visibility and human health. |
| **Poor** | Tolerable range: not all aspects of human health or the environment are adequately protected from possible adverse effects. Long-term control action may be necessary, depending on the frequency, duration and circumstances of the readings. |
| **Very Poor** | Intolerable range: in this range, continued high readings could pose a risk to public health. |

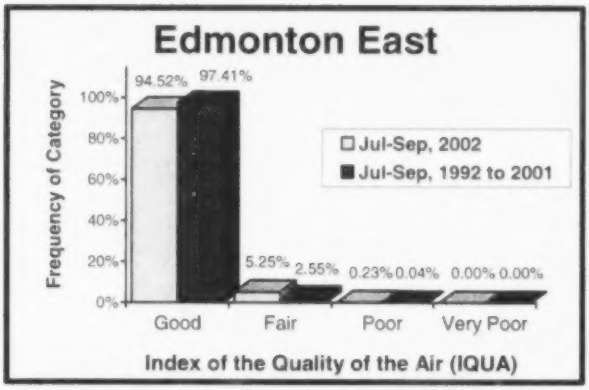
Source: Environment Canada. 1980. Guideline for a short-term air quality index. A report by the Federal-Provincial committee on Air Pollution.

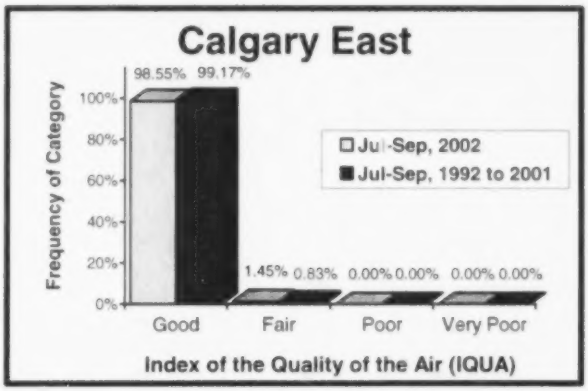

Edmonton Central
Frequency of Category
97.28% 99.13%
2.49% 0.86% 0.23% 0.01% 0.00% 0.00%
Jul-Sep, 2002
Jul-Sep, 1992 to 2001
Good
Fair
Poor
Very Poor
Index of the Quality of the Air (IQUA)

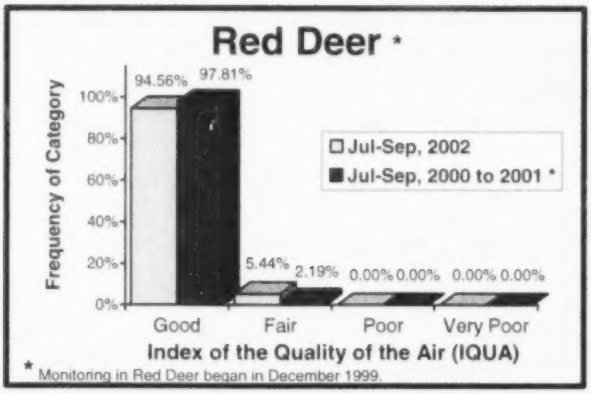

Calgary Central
Frequency of Category
98.90% 99.60%
1.10% 0.40% 0.00% 0.00% 0.00% 0.00%
Jul-Sep, 2002
Jul-Sep, 1992 to 2001
Good
Fair
Poor
Very Poor
Index of the Quality of the Air (IQUA)

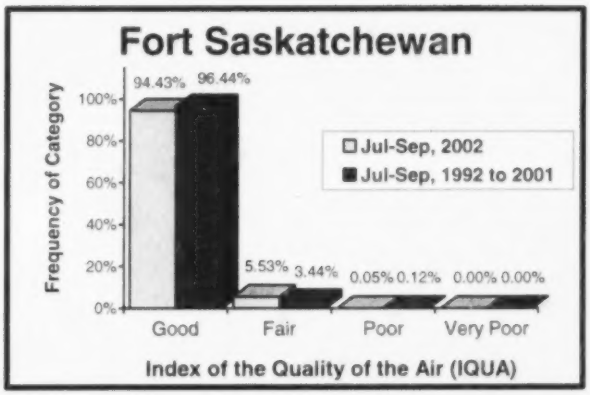

Edmonton Northwest
Frequency of Category
95.56% 97.85%
4.35% 2.11% 0.09% 0.04% 0.00% 0.00%
Jul-Sep, 2002
Jul-Sep, 1992 to 2001
Good
Fair
Poor
Very Poor
Index of the Quality of the Air (IQUA)


Calgary Northwest
Frequency of Category
92.84% 96.23%
7.07% 3.75% 0.09% 0.02% 0.00% 0.00%
Jul-Sep, 2002
Jul-Sep, 1992 to 2001
Good
Fair
Poor
Very Poor
Index of the Quality of the Air (IQUA)


Edmonton East
Frequency of Category
94.52% 97.41%
5.25% 2.55% 0.23% 0.04% 0.00% 0.00%
Jul-Sep, 2002
Jul-Sep, 1992 to 2001
Good
Fair
Poor
Very Poor
Index of the Quality of the Air (IQUA)


Calgary East
Frequency of Category
98.55% 99.17%
1.45% 0.83% 0.00% 0.00% 0.00% 0.00%
Jul-Sep, 2002
Jul-Sep, 1992 to 2001
Good
Fair
Poor
Very Poor
Index of the Quality of the Air (IQUA)


Red Deer *
Frequency of Category
94.56% 97.81%
5.44% 2.19% 0.00% 0.00% 0.00% 0.00%
Jul-Sep, 2002
Jul-Sep, 2000 to 2001 *
Good
Fair
Poor
Very Poor
Index of the Quality of the Air (IQUA)
* Monitoring in Red Deer began in December 1999.


Fort Saskatchewan
Frequency of Category
94.43% 96.44%
5.53% 3.44% 0.05% 0.12% 0.00% 0.00%
Jul-Sep, 2002
Jul-Sep, 1992 to 2001
Good
Fair
Poor
Very Poor
Index of the Quality of the Air (IQUA)

## Average Concentrations - July to September, 2002 [a]

| Parameter | Monitoring Period | Edmonton Stations | | | Calgary Stations | | | Red Deer [b] | Fort Saskatchewan | Beaverlodge [c] |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Central | Northwest | East | Central | Northwest | East | | | |
| Carbon Monoxide | Jul-Sep 2002 | 0.34 | 0.42 | 0.27 | 0.5 | 0.29 | 0.45 | 0.22 | 0.3 | n/a |
| (ppm) | Jul-Sep 1992-2001 | 0.55 | 0.57 | 0.34 | 0.69 | 0.44 | 0.59 | 0.21 | 0.35 | n/a |
| Dust and Smoke | Jul-Sep 2002 | 0.09 | 0.09 | 0.12 | 0.16 | 0.11 | 0.26 | n/a | 0.07 | n/a |
| (COH unit) | Jul-Sep 1992-2001 | 0.16 | 0.16 | 0.18 | 0.20 | 0.10 | 0.25 | n/a | 0.09 | n/a |
| Hydrogen Sulphide | Jul-Sep 2002 | n/a | n/a | 0.001 | n/a | n/a | 0.001 | 0.000 | 0.000 | n/a |
| (ppm) | Jul-Sep 1992-2001 | n/a | n/a | 0.001 | n/a | n/a | 0.001 | 0.000 | 0.000 | n/a |
| Nitrogen Dioxide | Jul-Sep 2002 | 0.018 | 0.016 | 0.013 | 0.019 | 0.011 | 0.018 | 0.008 | 0.008 | 0.002 |
| (ppm) | Jul-Sep 1992-2001 | 0.020 | 0.016 | 0.013 | 0.022 | 0.012 | 0.021 | 0.008 | 0.008 | 0.002 |
| Ozone | Jul-Sep 2002 | 0.019 | 0.021 | 0.023 | 0.019 | 0.027 | 0.019 | 0.024 | 0.024 | 0.021 |
| (ppm) | Jul-Sep 1992-2001 | 0.017 | 0.019 | 0.021 | 0.017 | 0.024 | 0.018 | 0.023 | 0.023 | 0.025 |
| Sulphur Dioxide | Jul-Sep 2002 | n/a | n/a | 0.002 | n/a | n/a | 0.002 | 0.001 | 0.001 | 0.000 |
| (ppm) | Jul-Sep 1992-2001 [d] | n/a | n/a | 0.002 | n/a | n/a | 0.003 | 0.000 | 0.001 | 0.000 |
| Total Hydrocarbons | Jul-Sep 2002 | 1.88 | 1.92 | 2.33 | 1.98 | 1.92 | 2.07 | 1.98 | 1.70 | n/a |
| (ppm) | Jul-Sep 1992-2001 | 1.99 | 1.98 | 2.31 | 2.04 | 1.95 | 2.09 | 2.10 | 1.86 | n/a |
| Particulate | Jul-Sep 2002 | n/a | 21.0 | n/a | 21.3 | n/a | n/a | n/a | n/a | n/a |
| ($PM_{10}$ in $\mu g/m^3$) | Jul-Sep 1992-2001 [e] | n/a | 24.4 | 25.6 | 27.0 | n/a | n/a | 21.5 | n/a | n/a |
| Particulate | Jul-Sep 2002 | 4.7 | 4.9 | 5.8 | 6.0 | n/a | n/a | 4.6 | 4.0 | n/a |
| ($PM_{2.5}$ in $\mu g/m^3$) | Jul-Sep 1992-2001 [f] | 6.7 | 10.9 | 8.0 | 10.9 | 13.3 | 14.5 | 7.3 | 4.0 | n/a |
| Ammonia | Jul-Sep 2002 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | 0.003 | n/a |
| (ppm) | Jul-Sep 1992-2001 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | 0.003 | n/a |

## Maximum One-Hour Concentrations - July to September, 2002 [a]

| Parameter | Edmonton Stations | | | Calgary Stations | | | Red Deer | Fort Saskatchewan | Beaverlodge | One-Hour Guideline |
|---|---|---|---|---|---|---|---|---|---|---|
| | Central | Northwest | East | Central | Northwest | East | | | | |
| Carbon Monoxide (ppm) | 2.8 | 4.0 | 1.0 | 3.0 | 1.6 | 3.0 | 1.4 | 1.3 | na | **13.0** |
| Dust and Smoke (COH Unit) | 0.6 | 1.3 | 1.3 | 1.4 | 1.0 | 2.1 | na | 1.7 | na | **na** |
| Hydrogen Sulphide (ppm) | na | na | 0.010 | na | na | 0.018 | 0.004 | 0.004 | na | **0.010** |
| Nitrogen Dioxide (ppm) | 0.065 | 0.058 | 0.058 | 0.060 | 0.052 | 0.052 | 0.029 | 0.042 | 0.011 | **0.212** |
| Ozone (ppm) | 0.095 | 0.094 | 0.101 | 0.064 | 0.082 | 0.064 | 0.079 | 0.083 | 0.060 | **0.082** |
| Sulphur Dioxide (ppm) | na | na | 0.031 | na | na | 0.016 | 0.004 | 0.023 | 0.004 | **0.172** |
| Total Hydrocarbons (ppm) | 3.1 | 4.2 | 14.1 | 3.0 | 2.5 | 3.4 | 5.0 | 3.9 | na | **na** |
| Particulate ($PM_{10}$ in $\mu g/m^3$) | na | 246 | na | 155 | na | na | na | na | na | **na** |
| Particulate ($PM_{2.5}$ in $\mu g/m^3$) | 47 | 40 | 76 | 44 | na | na | 43 | 67 | na | **na** |
| Ammonia (ppm) | na | na | na | na | na | na | na | 0.314 | na | **2.0** |

a All average and maximum values based on data collected from July to September.

b Monitoring at the Red Deer station began in December 1999.

c Monitoring at the Beaverlodge station began in November 1997.

d Sulphur dioxide monitoring began in February 1999 at the Beaverlodge station.

e $PM_{10}$ monitoring began in January 1996 at the Calgary Central station and November 1993 at the Edmonton Northwest station.

f $PM_{2.5}$ monitoring began in November 1997 at the Calgary Central station, July 1998 at the Edmonton Northwest station, October 2000 at the Edmonton Central station, August 2000 at the Edmonton East station, December 2000 at the Red Deer station and November 2001 at the Fort Saskatchewan station.

na Parameter not monitored at this location or no one-hour guideline for parameter.